RISK-BASED COVID-19 HEALTHCARE FACILITY VENTILATION GUIDANCE

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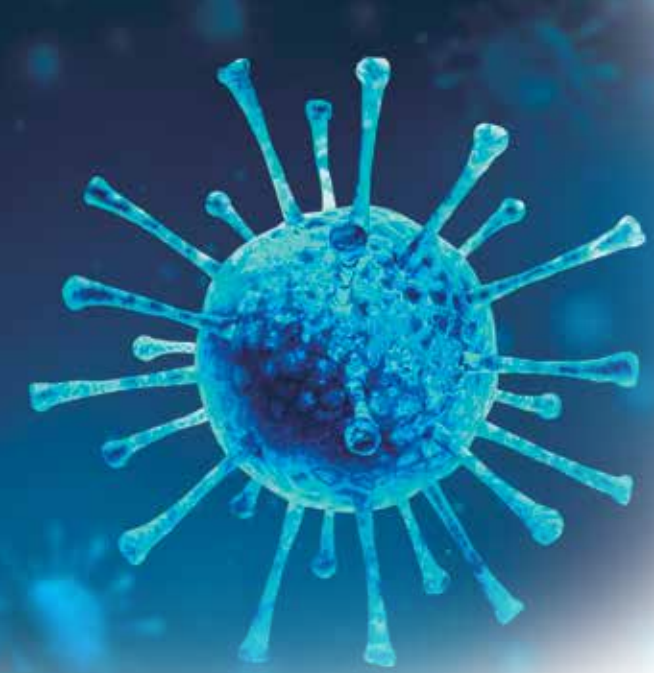


WHAT IS THIS GUIDE ABOUT?

This Guide describes how to reduce the risk of **far-field airborne transmission** of Covid-19 through improved ventilation*.

The Guide is based on the most current data and scientific guidance available at the time of writing (December 2021).

WHO SHOULD USE THIS GUIDE?

The Guide applies to all healthcare facilities and should be used by infection, prevention, and control (IPC) and facility managers.

VENTILATION

*Ventilation is the process by which a portion of outdoor air is supplied into or extracted from an indoor space for the purposes of diluting and removing indoor contaminants.

Ventilation rate is quantified by the rate of clean or outdoor air supplied into a space.

Adequate ventilation may be achieved by natural or mechanical means. These two broad modes of ventilation are defined as:

1 **Natural ventilation**, which refers to the delivery of fresh air through openings such as windows and doors. Windows and doors are the most common natural ventilation apertures for fresh air delivery.

2 **Mechanical ventilation**, which refers to ventilation driven by artificial means, such as an extractor fan installed in a window or door, or a central heating, ventilation, and air-conditioning (HVAC) system.

How do I know if a room has ineffective or inadequate ventilation?

1 The room feels stuffy, the air smells stale or you can smell the body odour of other people.

2 The room has only an air-conditioner, with closed windows and doors.

3 The spatially averaged carbon dioxide (CO_2) level is more than 400 parts per million (PPM) above ambient for non-healthcare spaces (refer to Table 1 for healthcare spaces).

COVID-19 INFORMATION SHEET

Modes of transmission of the SARS-CoV-2 virus for emerging variants has not changed. The World Health Organization (**WHO**) acknowledges that, while **airborne transmission** is a risk in scenarios with **inadequate ventilation, respiratory droplet** transmission remains the dominant mode of transmission.

THE FOLLOWING BASIC IPC MEASURES APPLY:

Wearing a facemask

Social distancing

Hand hygiene

Improved ventilation

No amount of ventilation alone can fully prevent the transmission of Covid-19 in indoor settings; administrative, environmental and personal protective equipment (PPE) controls should be maintained.

SARS-COV-2 TRANSMISSION CAN OCCUR IN THREE PRINCIPAL WAYS:

1. **Respiratory droplet:** Deposition of respiratory droplets and particles directly on exposed mucous membranes in the mouth, nose or eyes;
2. **Airborne:** Inhalation of very fine respiratory droplets and aerosol particles transmitted by air; and
3. **Contact:** Touching mucous membranes with hands that have been soiled either directly by virus-containing respiratory fluids or indirectly by touching surfaces with the virus on them.

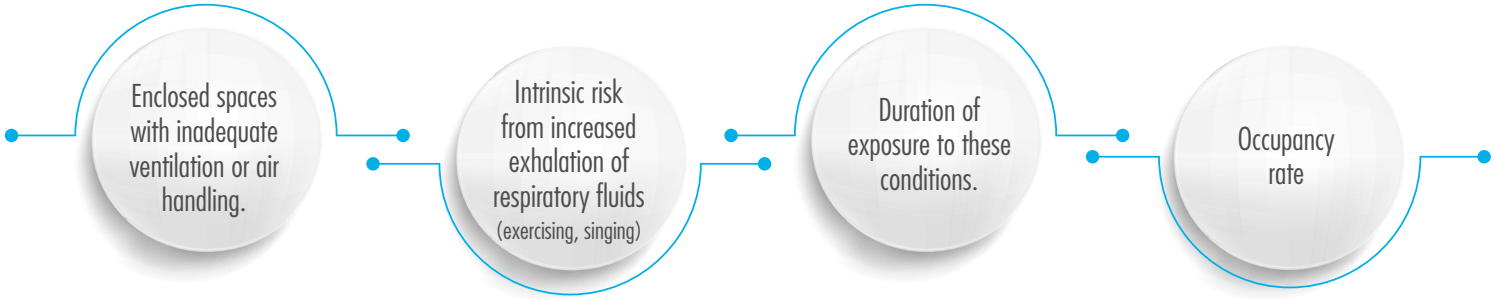
There are two ways that people can inhale the SARS CoV-2 virus:

1. **Near-field aerosol transmission** of short-range respiratory droplets, typically at distances of less than 1.5 m; and
2. **Far-field aerosol transmission**, most likely at distances of less than 1.5 m, with a diminishing risk at increasing distance.

WHAT IS THE RISK IN YOUR FACILITY?

This Guide focusses on reducing the risk of far-field airborne transmission. However, prevention measures for all modes of transmission remain effective and are equally recommended.

THE RISK FACTORS FOR FAR-FIELD AIRBORNE TRANSMISSION OF COVID-19



These factors are inter-dependent for maintaining acceptable indoor transmission risk.

The Risk Review Process, along with Table 1, can be used to help evaluate the risk in a facility.

Table 1 provides a tool to determine the acceptability of risk in your spaces from the above factors.

Per person ventilation rates can be estimated using indoor CO_2 monitors.

Typical waiting times and room functions should be known and can be used to determine the level of risk from the Table. Green fields represent acceptable risk; red and amber spaces require intervention to reduce risk.

Table 1 can also be used for planning feasible interventions by determining the limiting ventilation rate or daily exposure time when the other factors are fixed. Typically, the occupancy type of the room is fixed by function. Per-person ventilation rates can be increased by reducing occupancy levels, and exposure times can be reduced by decreasing waiting times.

People exhale CO_2, which can build up indoors where there is insufficient ventilation for the number of occupants (people) in the space. With improved ventilation, CO_2 levels will be lower.

FIGURE 1: CONTINUOUS RISK REVIEW PROCESS

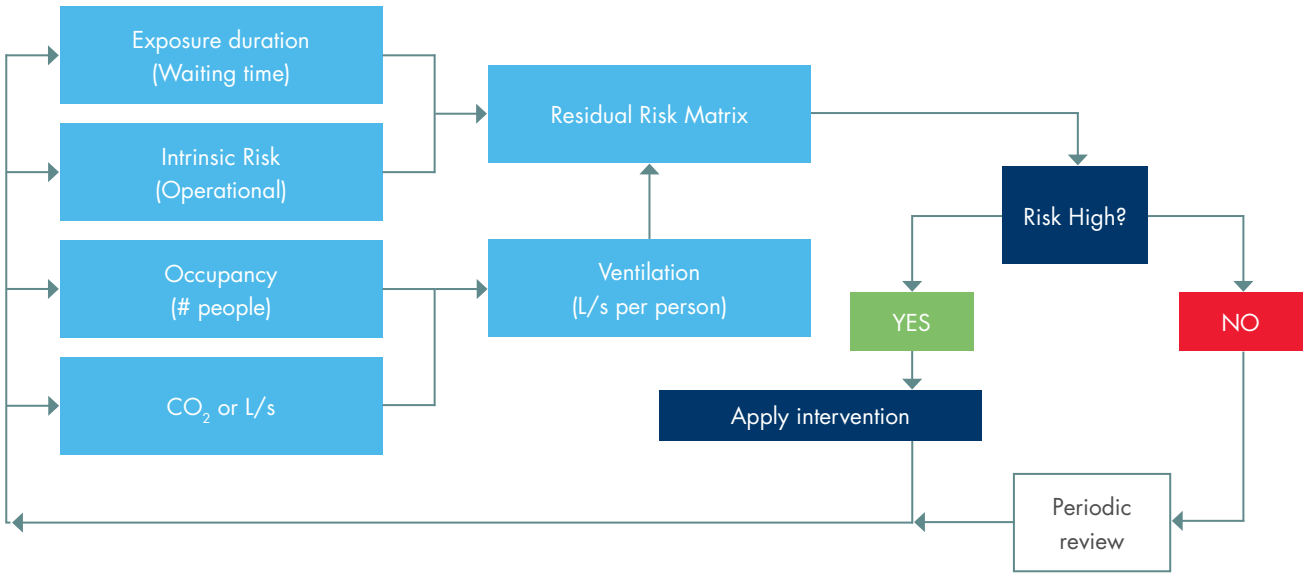


TABLE 1: WAITING TIMES AND VENTILATION RATES

Max Waiting Time @ a 2,5% Risk / 0.1 R0e		Min Ventilation Rates (L/s·person) or Maximum CO2 Level (PPM above ambient/outside)				
		7.5 L/s.p 845 PPM	15 L/s.p 420 PPM	30 L/s.p 210 PPM	60 L/s.p 105 PPM	160 L/s.p 40 PPM
Intrinsic Risks (Space Type)	Quiet and sedentary spaces • Low viral shedding • q≤12	00h45m	01h30m	03h00m	6h00m	16h00
	Busy spaces with talking • Medium viral shedding • q≤48	00h00m	00h15m	0h45m	01h30m	04h00m
	High activity spaces with loud talking/singing • High viral shedding • q≤120	00h00m	00h00m	00h15m	00h30m	01h15m

GENERAL INDOOR AIR QUALITY PRINCIPLES AND PRACTICAL APPLICATIONS

THE FOLLOWING GENERAL PRINCIPLES ARE PROVIDED AS GUIDANCE IN COMMON SCENARIOS TO MANAGE TRANSMISSION RISK AT ACCEPTABLE LEVELS.

1. **Limit room occupancy,** considering the acceptable ventilation rates.
   - Implement an **appointment system** to limit patient waiting times.
   - Implement a **queue management system** with clear visual communication of the process and progress to discourage queue anxiety and bunching

*A four-hour waiting time requires a minimum ventilation rate of **40 L/s/person** in a still waiting room or **160 L/s/person** in a bustling waiting room.*

2. Conduct a **comprehensive risk assessment*** including:
   - A **ventilation capacity** and performance assessment;
   - An **occupancy exposure risk assessment**; and
   - Development of control criteria and **CO_2 dilution assessments**.

**This will identify the critical control points to support appropriate facility-specific standard operating procedures (administrative, environmental and PPE).*

3. **Open windows** in naturally ventilated areas and areas with high CO_2 levels.

Forced horizontal air movement (oscillating or pedestal fans or room air cleaners) across groups of occupants should be avoided.

4. Check that mechanical **ventilation system filters** provide effective filtration and air cleaning.

NOTE: Removing existing filters or retrofitting high efficiency particulate air (HEPA) filtration for general areas is not recommended as this can cause critical system performance failures.

5. **External waiting areas** are recommended

These areas should be more than 5m form the discharge points of exhaust air from potentially contaminated internal spaces.

6 **Visitors' seating** allocations should be fixed for the duration of the waiting period as seat hopping increases cross contamination risk with each seat used in succession.

__Face-to-face seating__ should be at least __3m apart__ and __front-to-back seating__ should be at least __1.5m apart__. Standing waiting is not recommended.

7 **Sanitiser stations** should be accessible between different waiting areas and clinical areas.

8 **Flush ventilate** spaces by opening windows for at least 20 minutes before expected occupation; close windows at least 20 minutes after occupants have left.

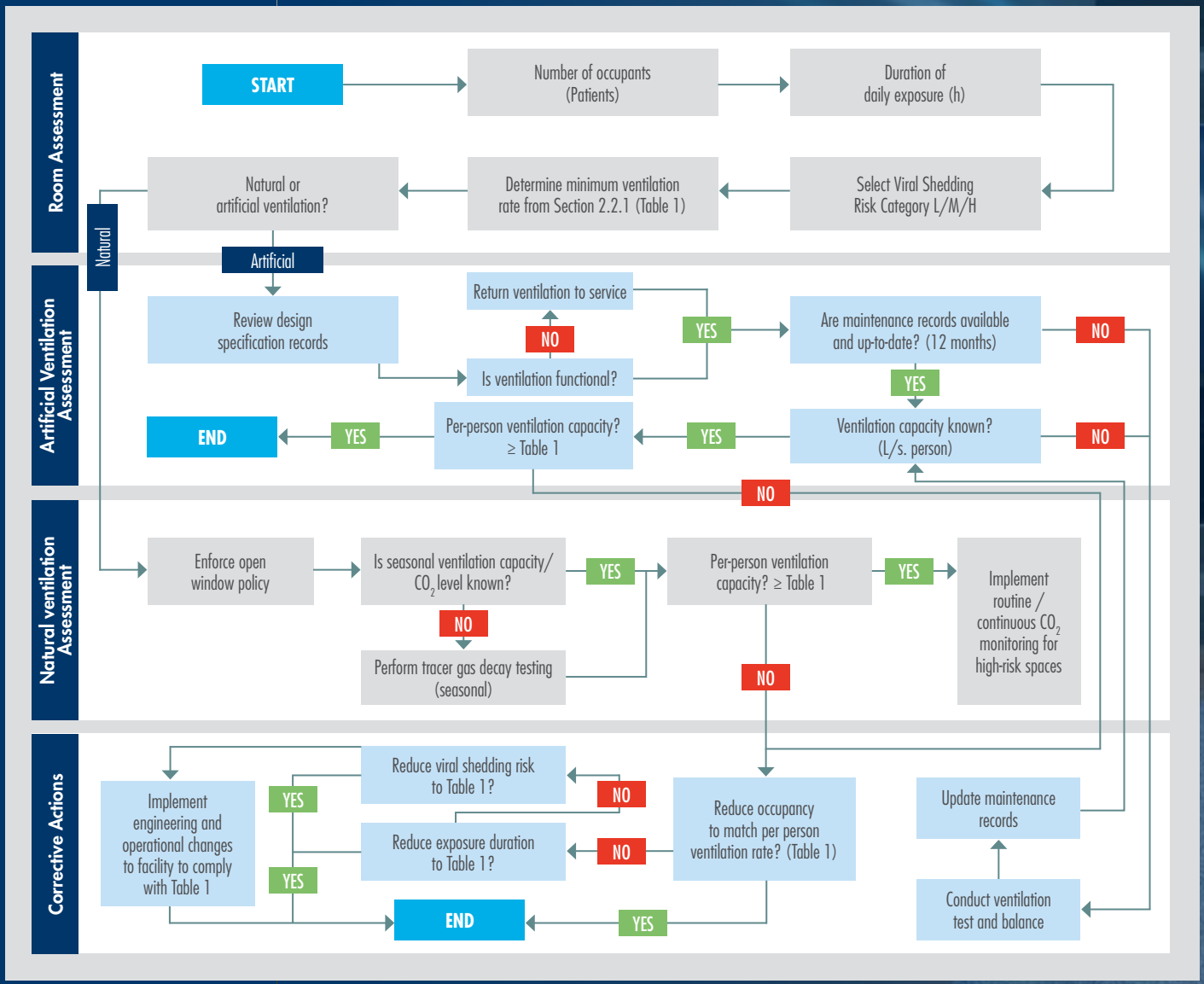
9 **Promote cross ventilation** where possible in naturally ventilated spaces.

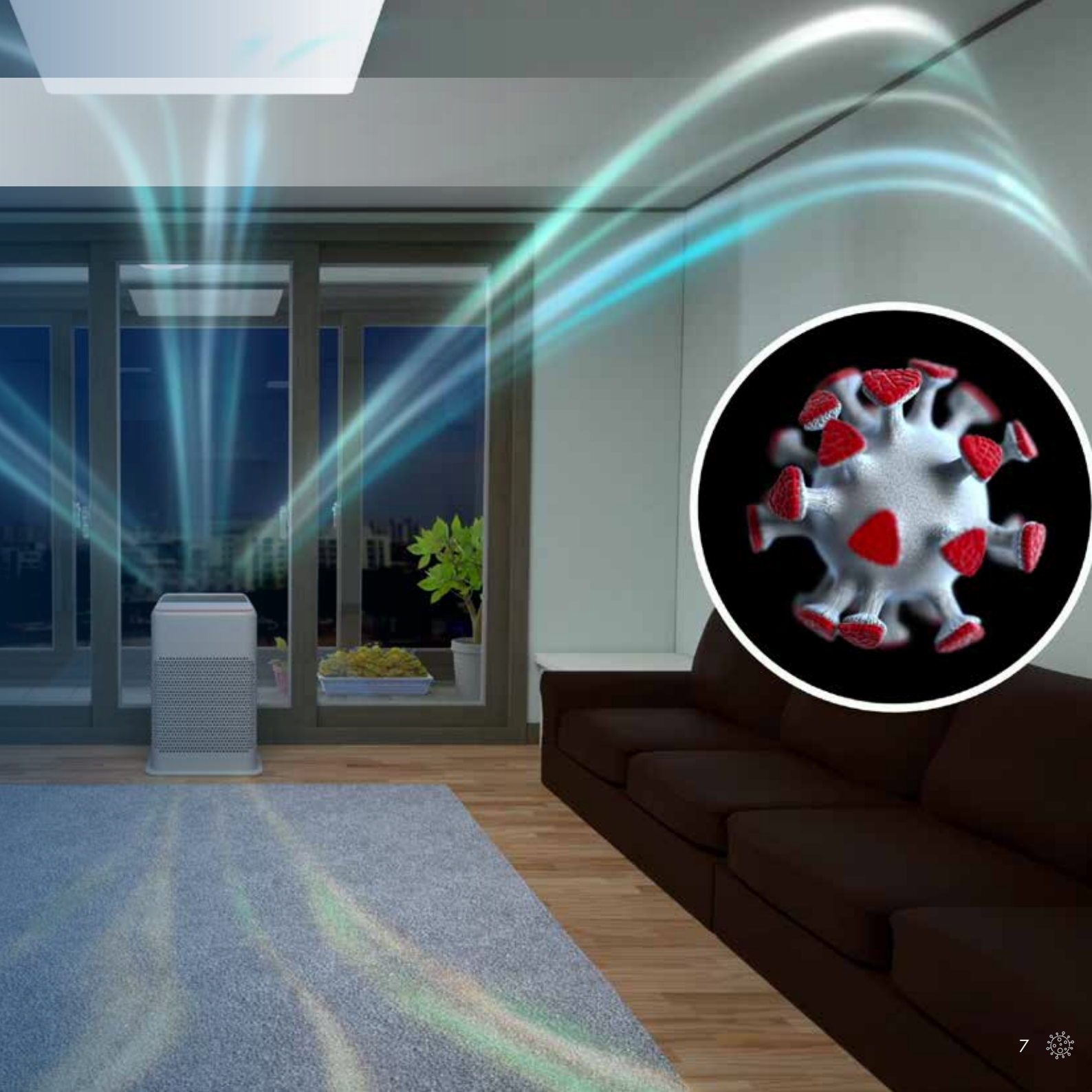
This means that windows open on opposite sides of the room to allow the air coming in one side to exit on the opposite side.

10 Before modifying the mechanical ventilation system, **reduce room occupancy** to simultaneously meet the physical distancing requirements and improve the available per person ventilation rates.

11 **Consult with a competent person** to understand the current ventilation balance and capacity.

VENTILATION ASSESSMENT PROCESS FOR HEALTHCARE SPACES





CONTACT DETAILS:

Dr. Jako Nice
jnice@csir.co.za

Tobias van Reenen
tvreenen@csir.co.za
www.csir.co.za